

Remarks/Arguments

Reconsideration of this application is requested.

Claim Status

Claims 1-33 were previously presented. Claims 3, 8-11, 13, 14, 16, 17, 20, 24-27, 29, 30, 32 and 33 are withdrawn from consideration as a result of a previous restriction of species requirement and election. Although this response does not add, amend or cancel any claims, a listing of claims is included with the proper status identifiers for the withdrawn claims.

Claim Rejections – 35 USC 103

Claims 1, 2, 4-7, 12, 15, 18, 19, 21-23, 28 and 31 are rejected under 35 USC 103(a) as obvious over Hori (US 6,469,398) in view of Aono et al. (US 5,521,429). Applicant respectfully traverses these rejections and submits that claims 1, 2, 4-7, 12, 15, 18, 19, 21-23, 28 and 31 include limitations that are neither taught nor suggested by Hori and Aono, and are therefore allowable in their current form.

Claims 1 and 18 are independent and require a first heat sink portion connected to a first electrode on a first principal surface of a semiconductor chip; a second heat sink portion connected to a second electrode on a second principal surface of the chip; and a housing that is formed not to cover part of the surfaces of the first and second heat sink portions. As shown in applicant's Fig. 2, heat sink portion 15 is connected to electrode 11a on the top surface of chip 11, and heat sink portion 16 is connected to electrode 11b on the bottom surface of chip 11. Housing 21 is formed so as not to cover heat sink portions 15 and 16, thereby allowing efficient release of heat generated from chip 11 directly to the outside.

Hori discloses a heat spreader 6 connected to a drain electrode 16 on a bottom surface of a chip 2, and a first lead 11 connected to a bump contact 7a (which is connected to source electrode 15) on a top surface of chip 2. Although the Action asserts that first lead 11 includes a heat sink portion, there is no disclosure in Hori that lead 11 performs any sort of heat sink function. In any event, as acknowledged

by the Action, lead 11 is covered entirely by sealing body 5, and Hori therefore does not meet the claim requirements that the housing be formed not to cover both first and second heat sinks.

The Action asserts that Aono remedies this deficiency by teaching "a lead frame 26 that includes a heat sink portion 25 exposed from the resin package 24". Applicant respectfully disagrees and submits that the Action has misinterpreted Aono. Element 25 of Aono is not a heat sink portion but is a "bonding island" where chip 21 is attached to heat sink 28. The "thick sections" 26 of leads 22 that extend outside of resin package 24 are not heat sinks. Aono specifically states at column 5, lines 64-66, that:

"The bottom surface of thick section 26 is separated from heat sink 28 by the thin length of thin section 27."

Thus, sections 26 that extend outside of resin package 24 are not heat sinks, rather, they are specifically stated as being separated from heat sink 28. As is evident from the drawings, heat sink 28 remains entirely covered by resin package 24.

Moreover, Aono shows only one heat sink portion attached to the bottom surface of chip 21. There is no second heat sink portion attached to a second surface of the chip as is required by applicant's claims. Thus, Aono, which discloses only one heat sink that is not even exposed, adds nothing to Hori, which already disclosed one exposed heat sink. What is missing and not provided by either of these references is a chip having heat sink portions attached to first and second (top and bottom) surfaces, both of which are not covered by the housing and are exposed to the outside.

Since Hori and Aono, taken alone or in combination, do not teach or suggest each and every element of claims 1 and 18, they cannot render obvious claims 1 and 18 or claims dependent thereon. The rejections under 35 USC 103 should be withdrawn.

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Amdt. dated August 3, 2005
Reply to Office Action of May 4, 2005

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Conclusion

This application is now believed to be in condition for allowance. The Examiner is invited to telephone the undersigned to resolve any issues that remain after entry of this amendment. Any fees due with this response may be charged to our Deposit Account No. 50-1314.

Respectfully submitted,
HOGAN & HARTSON L.L.P.

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